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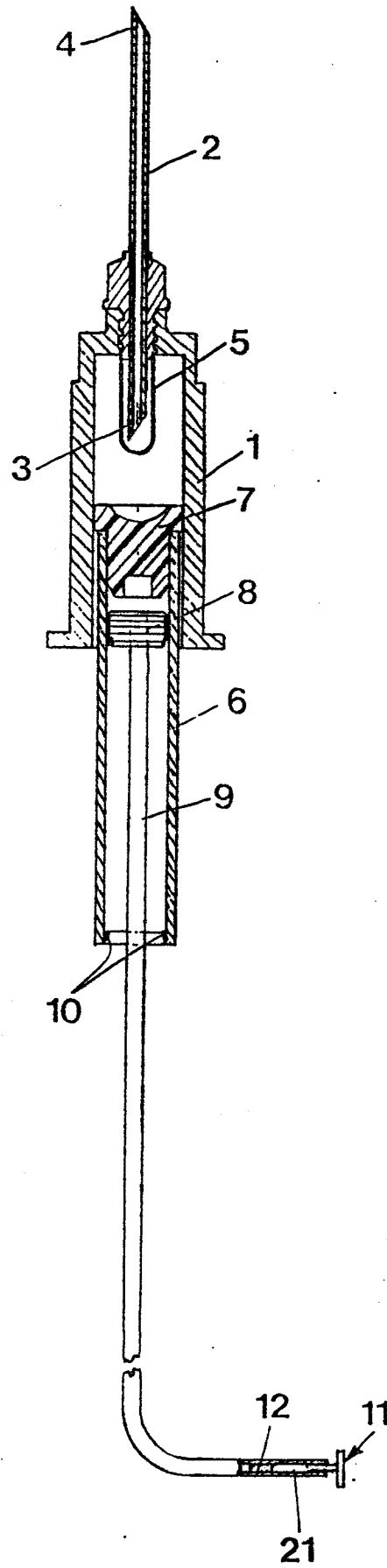
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DE FR GB IT SE(71) Applicant: Mediplast AB
Rasundavägen 60
S-171 52 Solna(SE)(72) Inventor: Ekholmer, Erik
Hammarbacken 1
S-182 35 Danderyd(SE)(74) Representative: Roth, Ernst Adolf Michael et al
GÖTEBORGS PATENTBYRA AB Box 5005
S-402 21 Göteborg(SE)

(54) Device for transferring a substance between at least two vessels in a closed system.

(57) An arrangement for a closed system for transferring a liquid from a vessel to a collection container - (8) which are attachable to each other via a coupling member (17) with a two sided cannula (2). One end of the collection container (6) is closed by a seal (7) which can be penetrated by the cannula (2). Behind the seal inside the container is a plunger (8) with an axial penetrating canal to which a tube (9) is attached. At the tube end away from the plunger (8) an openable stopper (11) is attached. By axial motion of the plunger (8) in the collection container (6) away from the seal reduced pressure is achieved in the container for sucking up the liquid through the cannula (2). After opening the stopper (11) the liquid can be forced out into the tube (9) by axial motion of the plunger toward the seal (7).

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FIG 1



DEVICE FOR TRANSFERRING A SUBSTANCE BETWEEN AT LEAST TWO VESSELS IN A CLOSED SYSTEM

The present invention relates to a device for transferring a liquid from a vessel e.g. a blood vessel, a ampoule or the like to a collection container, both of which can be attached to each other via a connecting apparatus with a two sided cannula, where at least the collecting container is closed at one end by a sealing cap which can be penetrated by the cannula, the collection container being in the shape of a cylinder for a plunger equipped with consist of a transparent tube an axial penetrating canal.

Background of the invention

In determining blood's sinking reaction the blood is mixed in a test tube with a citrate solution, after which the solution is transferred to a pipette up to a certain level. The pipette is placed in a holder with a length scale. The transfer of the blood-citrate mixture from the test tube to the pipette as a suction tube or by equipping the pipette with an apparatus used as a plunger in the test tube (US-4.037.464). In all cases there is a certain risk of contamination during transfer of the blood sample to the pipette. The problem has recently been accentuated because of the debate about AIDS risks and the personnel concerned must be protected from all contact with contaminated blood samples.

Also in other situations, for example during transfer of a substance contained in an ampule to another vessel and subsequently to its intended use an injection into a patient, one wants to protect the personnel concerned from contamination. Examples of such poisonous substances are cell poisons, isotope solutions and allergy inducing substances of different types.

The purpose of the invention and its most important characteristics

The purpose of the present invention is to achieve an apparatus of the above mentioned type with which the substance can be transferred between different vessels, for example transfer of a blood sample from a blood vessel to a pipette, in a closed system without contamination risk, and which apparatus is simple and inexpensive to produce. This has been achieved according to the invention

Description of the drawings

In the following the invention will be described in detail with reference to a pair of exemplifications shown on the attached drawings.

Figures 1-3 show sections through an exemplification of the apparatus according to the invention designed for determination of the sinking reaction, to which apparatus is attached a cannula set for vein punctuation during three different stages of the sample extraction procedure.

Figure 4 shows in perspective a part of a holder for determination of the sinking reaction with inserted pipettes equipped with apparatus according to the invention.

Figure 5 shows a section through a second exemplification of the apparatus according to the invention designed for transfer of a substance stored in an ampule.

Figure 6 shows the apparatus according to figures 5 and 6 which is uncoupled from the ampule and cannula set and attached to an injection needle for subsequent transfer of the substance to its intended use.

Description of the exemplifications

In figures 1-3 a conventional cannula set is shown which used for blood sample extraction according to the vacuum system. The set consists of a cannula case 1 one end of which is equipped with an attachment to a cannula with punctuation points 3 and 4 at both ends. The cannula point 3 inside the case 1 is appropriately surrounded by a self sealing membrane 5 in the form of a rubber cap which prevents blood leakage. During sample extraction a vein is punctured by the outer point 4 of the cannula 2, while the inner point 3 is used for puncturing the rubber stopper 7 to a collection container 6.

The collection container 6 according to the invention consists of a cylinder open at both ends, one end of which is sealed by a rubber stopper 7 intended to be punctured by the cannula 2. In the cylindrical collection container 6, which can be made of plastic or glass, a plunger 8 is fitted, to which is attached a rod 9, e.g. a transparent pipette tube or the like both of which are provided with an axial penetrating canal 21. Inside its open end the collection container 6 contains shoulders 10, which prevent the plunger 8 from being removed from the container 6. The free end of the pipette tube 9 away from the plunger 8 is closed with a stopper

11, for example a plug, and with it a blood filter 12 is placed. Instead of the stopper 11 a valve can be used which can open and close the passage in the pipette tube 9.

In use to the collection container 6 with attached pipette tube 9 is guided in the cannula set's case 1, as is shown in figure 1. Reduced pressure is created in the container 6 by drawing the plunger 8 toward the open end of the container. After vein punctation by the outer point 4 of the cannula 2 the rubber stopper 7 is punctured by the inner point 3 as is shown in figure 2, whereby the reduced pressure in the container 6 draws blood into it. In the container 6 a certain amount of citrate solution is appropriately contained. The container 6 with attached pipette tube 9 is then removed from the case 1, as shown in figure 3, whereby the membrane 5 reseals itself around the inner cannula point 3.

Transfer of the blood-citrate mixture from the container 6 to the pipette 9 is accomplished by removing the stopper 11 and attaching the pipette 9 to a holder 13 (figure 4) by its upper part. The container 6 with blood-citrate solution is moved upward in the direction of the plunger 8, whereby a blood column is pressed up in the pipette 9. When the blood has reached a designated level on the holder 13 the pipette is fixed in the lower part of the holder in attachments 14 for that purpose, between which the pipette tube is gripped so that the tube is closed. After the test has been completed both the pipette tube 9 and the collection container 6 can be discarded as a unit.

Thus a completely closed system from blood sample extraction to sinking reaction without contamination risk in any step is achieved using the arrangement according to the invention. If desired the outer part of the cannula 2 with point 4 can be enclosed by a rubber cap.

The exemplification shown in figures 5-7 is designed primarily for transfer of a liquid enclosed in an ampule 14 to the collection container 6 and thereafter further to its intended use, for example injection into a patient. The outer part of the cannula 2 equipped with a point 4 contains a self sealing membrane 15 in the form of a rubber cap, which seals the cannula point 4 after it has penetrated the ampule's 14 rubber stopper 16. The tube has a coupling member 17 on its end away from the plunger 8, to which a multi-ported valve is 18 is attachable. A flexible pressure equalization chamber 19 is attached to one of the valve's 18 connectors for equalization of the pressure in the ampule 14, when liquid is sucked up from it to the collection container 6. A non-wettable filter can be arranged in front of the pressure equalization chamber 19.

In use the plunger 8 is moved toward the rubber stopper 7, whereby the valve 18 is adjusted to allow air from the collection container 6 to be transferred to the pressure equalization chamber 19. The valve 18 is then closed. The collection container 6 can now be attached to the ampule 14 via the cannula set 1, 2 and liquid can be transferred to the collection container 6 by moving the plunger 8 downwards away from the rubber stopper 7. When the reduced pressure in the ampule 14 is so large that the pressure equalization chamber 19 is attached to the tube 9. Air can now rise up in the container 6, and be pressed by the plunger 8 up into the ampule 14 and achieve a pressure equalization in it. This procedure can be repeated when necessary.

When liquid from one or more ampules 14 has been transferred to the collection container 6 it is uncoupled from the cannula set 1, 2 and possibly also from the valve 18. The coupling member 17 is then connected to an injection needle 20, a vein catheter, infusion apparatus or the like for transfer of the liquid to the intended use, for example to a patient. Of course the valve 18 can remain and the cannula 20 or the equivalent can be attached to the tube 9 via the valve 18.

The collection container 6 can be designed as a delivery container for certain medications in powder form, for example freeze dried cell poisons, which are dissolved by the liquid which is taken from the ampule 14. In order to prevent the powder from blocking the penetrating cannula in the tube 9 a liquid or air permeable filter (not shown) can be placed in the tube or attached to it. For this application type the valve 18 is appropriately permanently attached to the tube 9, as well as the pressure equalization chamber 19 to the valve.

The invention is not restricted to the exemplifications shown but instead a number of modifications is possible within the framework of the patent claims.

Claims

1. Device for transferring a liquid from a vessel e.g. a blood vessel, a ampule (14) or the like to a collection container (6), both of which can be attached to each other via a connecting apparatus - (1) with a two sided cannula (2), where at least the collection container (6) is closed at one end by a sealing cap (7) which can be penetrated by the cannula (2), the collection container (6) being in the shape of a cylinder for a plunger (8), equipped with a rod (9), both of which are provided with an axial penetrating canal,

characterized by,

that the collection container (6) consists of a cylinder open at both ends, one end of which is sealable by said sealing cap (7) and through which other end the plunger rod (9) is extending, that on the free end of the plunger rod (9) an openable stopper (11) is attached whereby through axial motion of the plunger in the collection container away from the sealing cap (7) reduced pressure is achieved in the collection container for sucking up the liquid in it through the cannula (2), and after opening the stopper (11) the liquid can be brought into the rod (9) by motion of the plunger (8) toward the collection container's (6) sealing cap (7).

2. Device according to claim 1,

characterized by,

the said rod (9) consists of a transparent tube being shaped as a pipette to be used in connection with determination of the sinking reaction for a blood sample.

3. Device according to claim 2,

characterized by,

that a blood filter (12) is attached to the pipette (9) within the stopper (11).

4. Device according to claim 1,

characterized by,

that the rod (9) having a coupling member (17) at the end away from the plunger for attachment of a cannula (20), vein catheter, infusion apparatus or the like.

5. Device according to claim 4,

characterized by,

that a multi-ported valve (18) is connected to the tube (9) or coupling member (17), where a flexible pressure equalization chamber (19) is connectable to one of the valve ports.

6. Device according to one or several of the above claims,

characterized by,

that the two sided cannula's (2) inner and/or outer parts equipped with points (3, 4) being enclosed each in its own self sealing membrane (5, 15) in the form of a rubber cap or the like.

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FIG 1

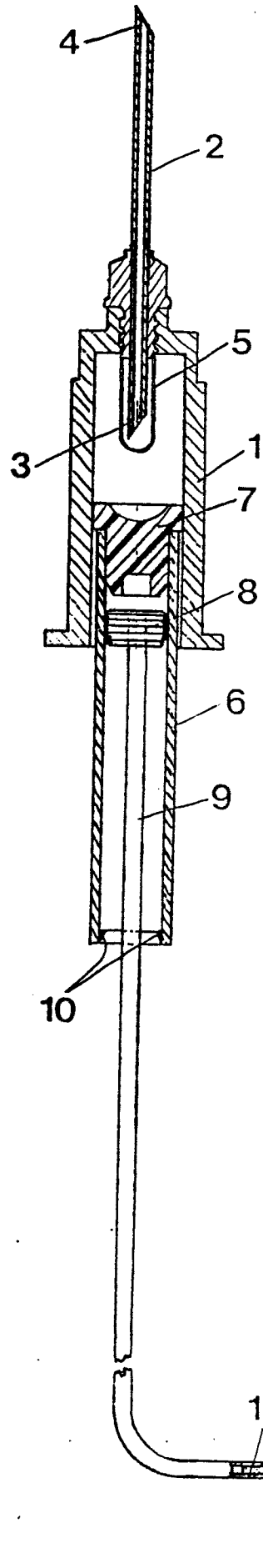


FIG 2

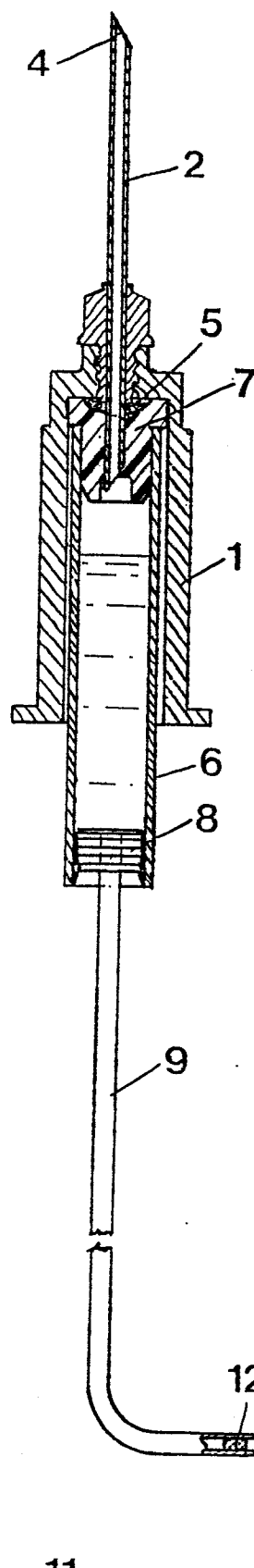


FIG 3

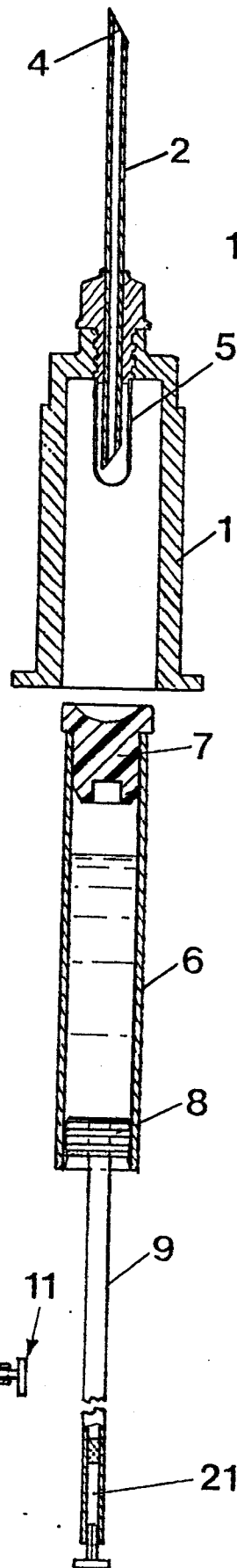


FIG 4

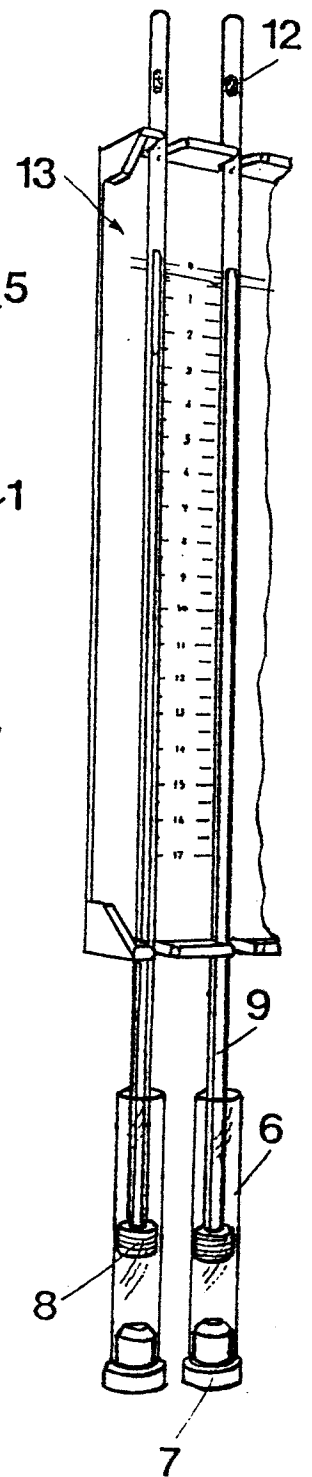
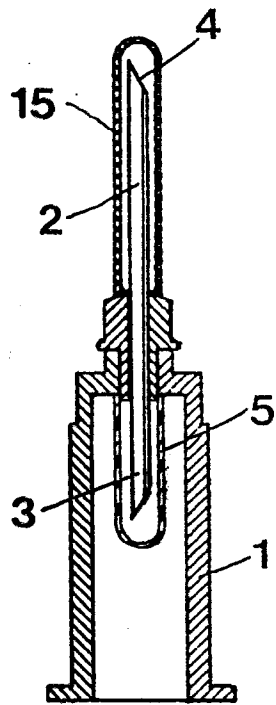
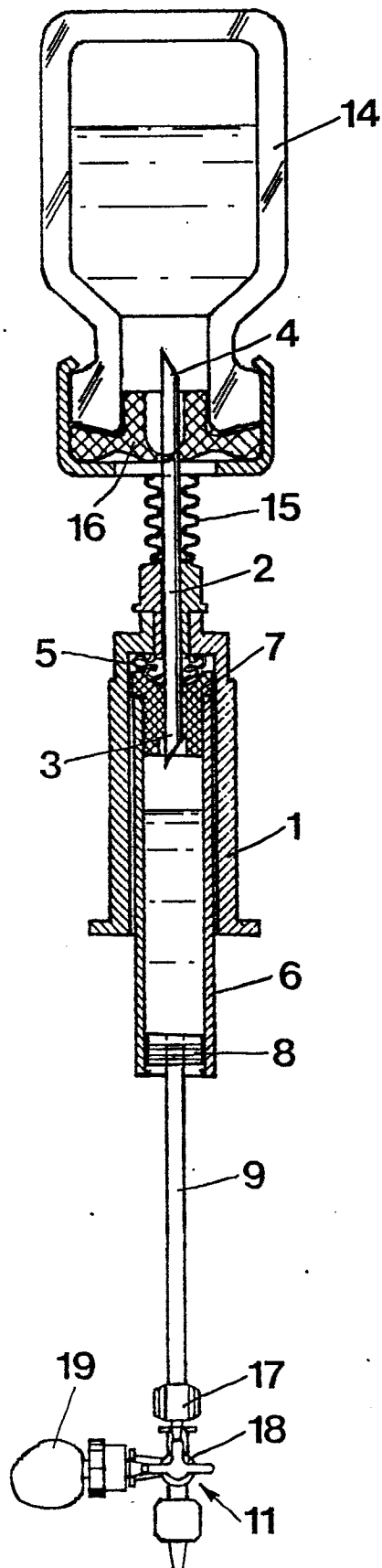


FIG 5**FIG 6****FIG 7**